We claim:

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1. A computer graphics image rendering method, comprising:

as a precomputation, calculating data of macro-scale radiance transfer coarsely sampled over a surface of a modeled object;

as a precomputation, calculating data of meso-scale radiance transfer finely sampled over a meso-structure texture patch mapped over a surface of the modeled object;

based on a combination of the macro-scale radiance transfer data and the mesoscale radiance transfer data, evaluating radiance transfer over at least a portion of the surface of the modeled object from a lighting environment for a view direction; and

producing an image of the modeled object as lit according to the radiance transfer evaluation.

- 2. The computer graphics image rendering method of claim 1 wherein the mesoscale radiance transfer data is a height field.
- 3. The computer graphics image rendering method of claim 1 wherein calculating the meso-scale radiance transfer data comprises:

producing a radiance transfer texture encoding response to incident lighting expressed as a linear sum of lighting basis functions at a location on the meso-structure texture patch; and

producing a spatial index map to map the locations on the meso-structure texture patch onto the surface of the modeled object, via a precomputed texture synthesis.

4. A method of computer rendering of a graphics image of a modeled object in a lighting environment combining macro- and meso-scale effects, comprising:

for a location on a surface of the modeled object viewed from a view direction in the graphics image, determining lighting transferred by the object at the location from the lighting environment as a function of a lighting basis function representation of lighting 5

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incident on the object from the lighting environment, a representation on the lighting basis of the radiance transfer of the object's surface sampled at a macro-scale, and a representation on the lighting basis of the radiance transfer of a meso-structure of the object's surface sampled at a meso-scale; and

producing an image of the modeled object in the lighting environment having the location on the modeled object surface lit according to the determined transferred lighting.

- 5. The method of claim 4 wherein the representation of the radiance transfer of the object's surface sampled at a macro-scale is a pre-computed radiance transfer matrix.
 - 6. The method of claim 4 wherein the representation of the radiance transfer of a meso-structure of the object's surface sampled at a meso-scale is a radiance transfer texture.
 - 7. The method of claim 4 wherein the representation of the radiance transfer of a meso-structure of the object's surface sampled at a meso-scale comprises a radiance transfer texture encoding response to incident lighting expressed as a linear sum of lighting basis functions at a location on a meso-structure patch, and a spatial index map mapping from locations on the surface of the modeled object to locations on the meso-structure patch, and wherein the spatial index map operates as an index to the radiance transfer texture.
- 8. The method of claim 4 wherein the function is B(q(u_p),v_p)·(M_pL), where B
 25 is a radiance transfer texture encoding response at a location on a meso-structure patch in a view direction v_p to incident lighting and indexed via an id map q(u_p) that maps locations on the surface of the modeled object to locations on the meso-structure patch, where M_p is a precomputed radiance transfer matrix encoding radiance response of the location on the surface of the modeled object to incident lighting L of the lighting
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9. Computer-readable data carrying media having encoded thereon bi-scale radiance transfer data for a modeled object for use in computer rendering of images of the modeled object in a lighting environment, the bi-scale radiance transfer data comprising:

macro-scale transfer matrices for a plurality of locations sampled at a macro-scale on a surface of the modeled object, the macro-scale transfer matrices representing radiance transfer including global effects of a respective location of the surface of the modeled object to incident lighting expressed on a lighting basis;

a meso-scale radiance transfer texture representing radiance transfer of a plurality of locations sampled at a meso-scale across a meso-structure patch for a plurality of views and lighting environments; and

an id map representing a mapping of the meso-structure patch over at least a portion of the surface of the modeled object.

- 10. The computer-readable data carrying media of claim 9 wherein the global effects comprise self-shadowing and interreflection of the modeled object.
- 11. A computer system for rendering graphics images of a modeled object, comprising:

a macro-scale lighting simulator operating to perform a lighting simulation of the modeled object to produce a set of macro-scale radiance transfer matrices for a set of macro-scale sampled locations over a surface of the modeled object representing radiance response including global effects to incident lighting at the respective macro-scale sampled locations;

a meso-scale lighting simulator operating to perform a lighting simulation of a meso-structure patch to produce a radiance transfer texture representing radiance transfer of a set of meso-scale sampling locations over a meso-structure patch for a plurality of views and lighting environments;

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a texture synthesizer operating to synthesize the meso-structure patch over at least a portion of the modeled object to produce an id map representing a mapping of the meso-structure patch to the portion of the modeled object; and

an image rendering engine operating to determine lighting from a lighting environment for each of a plurality of viewed locations on the modeled object in an image as a function of incident lighting from the lighting environment, the set of macroscale radiance transfer matrices, and the radiance transfer texture as indexed by the id map; and

a display driver operating to present the image of the modeled object in the lighting environment with the determined lighting.